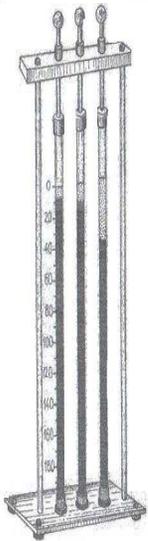


SEDIMENTATION RATE OF ERYTHROCYTES

INTRODUCTION

Blood represents a suspension of cells in plasma; erythrocytes have 1,100 density, while the plasma has 1,024-1028. If blood is collected in an anticoagulant and is left at rest, according to the law of gravity, erythrocytes should be deposited on the bottom of the tube. Actually, erythrocytes settle slowly and this is a very important erythrocyte property that is named erythrocyte suspension stability= stability of suspension. This property is evaluated by speed sedimentation assessment (SRE) or rate sedimentation. Erythrocytes present a negative electrical charge on the outside the membrane. This is named zeta potential responsible by the maintaining cells suspension in plasma (forces of rejection). Zeta potential is due to the presence of glycoproteins on the membrane surface. In addition, the stability of suspension of the red cells depends on the concentration of the asymmetric proteins in the plasma (especially haptoglobin, ceruloplasmin, gama globulins, fibrinogen). The increase of asymmetric protein concentration reduces the electrical negative charge of the membrane and erythrocytes aggregate into rouleaux, so that ESR will increase.



PRINCIPLE: if the blood is collected in an anticoagulant, at the rest condition erythrocytes settles in a variable period of time, usually 1 or 2 hours. This is the Westergreen method.

MATERIALS REQUIRED: needles, 2ml syringe, alcohol, cotton, sodium citrate 3, 8% solution, Westergreen pipettes (it has 300 mm length, 2, 5 mm in internal diameter and is graduated millimeter from 0 to 200 (mm); when it is fixed on the stand, point 0 is on the top), Westergreen stand- is provided with two different fixing systems: there is a rubber stopper on the bottom and a spring cap on the top.

Figure Westergreen device

PROCEDURE: The syringe should be washed with anticoagulant and after that follows the aspiration of 0, 4 ml sodium citrate solution. Blood is aspirated from vein puncture to division 2 ml. The content of syringe is well mixed and transferred to a recipient. Westergreen pipette is filled up to division 0 and is placed vertically in the stand. The readings are performed at 1, 2, 3 or 24 hours.



Figure

If blood collecting is performed into the vacutainers system, we are using the vacutainer with black cork (especially for ERS).The vacutainer is placed in the stand after collecting and mixing the sample and it is read after 1, 2 hour.

INTERPRETATION

Normal values - male 6-8 mm/h

-female 10-16 mm/h

Variations

Increased ESR:

- a) acute infections-elevated ESR is due to the increase of alpha-2-globulins
- b) chronic infections: gamma-globulins are at high level
- c) anemia (reduced number of erythrocytes decrease the blood viscosity)
- d) destructive disease (cancer, rheumatism)-the fibrinogen is at high level.

Reduced ESR:

- a) polyglobulia: increase blood viscosity reduces the ESR
- b) mechanical jaundice: the retention of negatively charged bile acids which are absorbed on the erythrocyte surface maintain the suspension
- c) acidosis: for instance, in acidosis coma, the acids are absorbed on the erythrocyte membrane and increase the zeta potential
- d) Anaphylaxis and allergy: The immunoglobulins are consumed in the antigen-antibody reactions, the concentration of gamma globulin decreases (IgE are involved here) and ESR decreases.